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EDITORIAL

POST–SOVIET UFOLOGY: A VIEW FROM INSIDE

During the many years, before "perestroika", information on Soviet UFO sightings was for Western researchers a real gem, because of the high barriers that it had to overcome on its way to the West. These were the barriers of the dead silence of mass-media and the witnesses themselves, as well as the problems of translating and sending abroad unauthorized materials. Some Soviet amateur ufological groups began contacts with their Western colleagues as early as the 60-s, but these contacts remained for decades rather cautious. One could receive with gratitude free copies of American, English, or French UFO books and journals, but he would have thought twice before sending in return any description of a UFO sighting that had not been published in the "central press".

Of course, the feeble streamlet of the Soviet UFO data that did reach Western ufological organizations and periodicals[1] contained both reliable and not so reliable reports, being a usual mixture of obvious IFOs and quasi-UFOs with UFOs in the strict sense of the term. This was fully explainable and did not raise much discontent on the part of Western ufologists. After all, everyone understood that these data were obtained with difficulty in a totalitarian state, being another – and valuable – confirmation that flying saucers under socialism do not differ significantly from their democratic counterparts. And thank goodness for that.

Beginning from 1986, this streamlet turned, however, into a real flood. It became possible for Soviet citizens in general, and for Soviet ufologists in particular, to go abroad by invitations of their foreign friends and colleagues (although the exit visas were not abolished until the disintegration of the USSR), which resulted in considerable expansion of the data exchange. Mutual visits and participation of ufologists from the C.I.S. in international ufological conferences are no longer something extraordinary. Even the secret UFO reports, collected by the Ministry of Defense of the former USSR, are getting open in the atmosphere of the new-found freedom.[2] This is in fact quite a new situation that can influence very much the world ufology. And it surely requires a correct evaluation.

Such an evaluation is the more needed since at the present time two opposite viewpoints on the situation – over-enthusiastic and over-sceptic ones – have become widespread. Over-enthusiasts believe that declassified Soviet UFO data will solve the UFO problem and will prove the ET hypothesis; over-sceptics are certain that the Soviet UFO files contain only rubbish which is not worthy of serious analysis, and on the whole that cunning Russians are simply trying to earn the longed-for dollars, foisting on credulous Western ufologists fairy tales instead of real information. "In fact, given today's economic crisis in Russia, – exclaims the science writer James Oberg, – thousands of people of all classes, but particularly from the military services, are desperately seeking – or deliberately creating – anything that can sell to Western buyers with bucks. UFO files are one of the few exportable raw materials with a market in the West..."[3]

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Is this a sound approach to the UFO reports from the former Soviet Union? The Soviet government, though not democratically elected, was neither more stupid, nor more clever than other — democratic — governments. It could not, of course, ignore the UFO phenomenon, since it does exist and cannot be fully reduced to misinterpretations of identifiable natural and technological phenomena by untrained observers. After all, the UFO problem is a practical one: a pilot in the sky encounters "flying saucers", let's say, more often than a scientist in his laboratory. As such, it cannot be thrown away even if the leading scientists are inclined to regard it as a piece of nonsense. At the same time, it is (or seems to be) a practical problem of secondary importance — since such encounters rarely lead to any real damage or other appreciable consequences. Therefore the Soviet government, deeply stuck in the arm race, conflicts in the "third world", economic difficulties, etc., simply was not able to pay "excessive" attention to the problem. The UFO reports were being collected and analyzed, but no real breakthrough could be achieved under such conditions.

"Independent ufologists" in the USSR (first of all, Dr. Yu.A.Fomin, Dr. F.Yu.Zigel, and their colleagues) also collected UFO data and tried to understand the realities that manifested themselves in them. Sometimes they even issued typewritten works (in a very limited number of copies, but avoiding the vigilant eye of Glavlit — the Soviet censorship). There is in these works a lot of important information, as well as a good deal of "noise". Having no access to secret data about space and military tests, the researchers could, in a number of cases, mistake rocket launchings and atmospheric reentries for genuine UFOs. But it is sufficient to scrutinize the seven volumes of Dr. Zigel's collections of UFO reports, to understand that this ore is rich in metal. In fact, it can be noted that the intellectual and professional levels of the "underground" Soviet ufology were high, despite the hard conditions, under which these researchers worked.

In short, the "over-enthusiasts" seem to be somewhat too hasty in their conclusions. Most likely, there will be no startling revelations in the UFO files of the former Soviet military, although there certainly can be important information there on UFO sightings in the USSR, the statistical data, and the views of the Soviet establishment on the UFO phenomenon, as well as on Western investigations of the phenomenon. These data will probably expand existing UFO files, not transforming, however, our understanding of the phenomenon too radically.

But the "over-sceptics" are also wrong. In fact, this information is quite worthy of serious — and unprejudiced — analysis. In the 50-s, 60-s, and even in the 70-s the ufological "research field" in the USSR remained practically "clean", not contaminated by numerous sensational newspaper articles, so usual for the Western countries. Then a UFO observer in the Soviet Union rarely knew anything concrete about the established traits of the UFO appearance and behavior. At best, he knew that, according to the official point of view, UFOs did not exist; and if he made up his mind to send his report to a newspaper, a popular-scientific journal, an observatory, or directly to the Academy of Sciences, it meant he regarded the event as very unusual and worthy of complications. It concerned both "official" and "non-official" observers. The military pilots, for example, sometimes refrained from reporting their UFO encounters even when there existed an instruction "from the top" to do this: the consequences of following the instruction could not be foreseen.

J.Oberg rather arrogantly judges the post-Soviet ufology as if on behalf of the Western one. His criterion is simple: those who disagree with Mr. Oberg's opinion on the nature of some UFO (or rather "UFO") sightings are incompetent and must not be tolerated in the civilized society. "Serious UFOlogists will have to quarantine the obviously hopelessly infected UFO lore from Russia and disregard it all. <...> Every decade or two, the question can be reconsidered with a simple test: Do leading Russian UFOlogists still insist on the alien nature of the 1967 crescent UFOs and the 1977 "jellyfish" UFO? If so, slam the door on them again."[4]

Really and truly, having read such a passage, any Russian (and, just in case, Ukrainian) ufologist will hurry to swear that never in his life he believed in the alien nature of these damned "UFOs"! We Russians remember well what the word "quarantine" can mean and do not want to take risks. When such a prominent American ufologist does all he can to set us in the right way, it only remains to obediently follow his instructions. Thank you, Mr. Oberg, for our happy future!

To be on the safe side, I must confess that it seems to me quite plausible that the 1967 "crescents" were in fact missile warheads reentering the atmosphere after an incomplete circuit around the globe. Does it totally exclude the question of the crescent-shaped UFOs out of ufological consideration? Not necessarily. This question needs, to my mind, a more detailed examination.

As for the Petrozavodsk "jellyfish" phenomenon, it was certainly closely connected with the launching of the "Cosmos-955" satellite, but there were some important anomalous features as well. I hope to publish a paper discussing this phenomenon in some detail in a future issue of RB.

Is ufology in the states of the C.I.S. perfect? Of course, not. Not more than American or European ufology is. In some respects our ufology is even "less perfect", for the simple reason that it is just beginning to develop under the new conditions of freedom and market economy. As a result, it is

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UFOs: A POSSIBLE MECHANISM OF FORMATION, BEHAVIOR AND ENVIRONMENTAL IMPACT

Vladimir I. Mazhuga

There are natural phenomena which are extremely difficult to understand and explain. Numerous hypotheses appear whose authors try to interpret these phenomena and doing so they usually far exceed the boundaries of the known laws of nature. This is very typical for such a complicated process as formation, behavior and environmental impact of unidentified flying objects (UFOs), many aspects of whose behavior are considered anomalous, inexplicable and even intelligent. Among these phenomena we can mention the following: pressure of a light beam on a person, absence of shadow, strange changes of structure and composition of soil in the places of "landings" and "near-landings", a power screen set up by the object, a temporal discharging of vehicle accumulators, incomprehensible messages in radio band of electromagnetic waves, and many others. It appears necessary not only to find the mechanism of UFOs formation, but to try to explain the whole set of phenomena connected with their behavior and environmental impact, proceeding, if possible, from the minimum number of assumptions and preconditions. The behavior of UFOs and their environmental impact have to be somehow connected with the mechanism of their formation.

Our planet the Earth is a particle in the boundless Universe. It is but natural that the processes occurring in some part of the Universe sometimes affect us as well. For example, the Earth is constantly subjected to action of high energy charged particles. From the cosmic rays physics it is known that individual high-energy relativistic charged particles (cosmic rays) when interacting with atmosphere, give birth to an electron-photon shower (EPS) in which electrons and photons make up 95–98 % of all the particles. Besides, according to the existing concepts [1, p. 379–417], cosmic rays are accelerated in the form of fluxes oriented in any direction with a subsequent dissipation. The density of the flux exceeds that of ambient space by 10^{10}. Let us assume that not all the particles are dissipated, and a part of them reaches the Earth in the form of beams or bunches. As they interact with the atmosphere, a combined electron-photon shower appears. A flux of electrons in the form of a combined EPS gives rise to its own magnetic field under action of which a bunch of electrons is formed.

It is known from the physics of strong-current relativistic electron bunches that the behavior of an electron bunch in its own magnetic field is characterized by the equilibrium Alfvene current of the bunch in the absence of a strong longitudinal external magnetic field:

$$I_A = 17\gamma\beta\frac{2r_0 - a}{a}kA \qquad [2, p. 11],$$

where r_0 is the bunch radius (for a solid bunch r_0 = a); a is the wall thickness of a tubular bunch; $\gamma = (1-\beta^2)^{-\frac{1}{2}}$; $\beta = \frac{v}{c}$; v is the velocity of particles in the direction of the bunch motion; c is the velocity of light. For example, at β^2 = 0.99, I_A = 170000 A.

Then, from $I = n_e e c \pi a^2$ [3, p. 25], where a is the electron bunch radius; I is the electron bunch current; e is the electron charge; n_e is the density of electrons in the bunch, we find the required density of electrons in a bunch at which it is possible to obtain the current equal to Alfvene one $n_e = 0.45 \cdot 10^8$ cm^{-3}.

The maximum possible electron density in a combined EPS at the atmospheric pressure $n_e \approx 10^{19}$ cm^{-3}. Thus, due to the above mentioned mechanism, currents may appear which considerably exceed the Alfvene current. It may happen in the case when there is the corresponding quantity and sufficient energy of particles in the initial bunch of cosmic rays.

With maximum bunch current $I < I_A$, as a combined EPS is developing, under the action of its own magnetic field, the energy of the translational motion of the electrons making up the bunch transforms into the energy of rotation, the bunch radius will first increase and then, after reaching some critical value, will decrease, and the bunch will acquire a cigar-type shape. If the maximum bunch current $I \geq I_A$, then, as the current reaches the value $I = I_A$, electrons stop moving in the direction of the magnetic field increase and travel in a circle, and at $I > I_A$ they begin moving in the reverse direction. Thus, at $I \geq I_A$ and with short bunches of primary particles, electrons possessing a high velocity under the action of the electric and magnetic fields of the bunch are "smeared" around the surface of a sphere. In the case of long cosmic rays, the subsequent particles of EPS "squeeze" the bunch of plasma into a disk (they block the electrons from moving in the opposite direction with respect to the EPS motion).

The subdivision of UFOs into three types of form is conventional, as the conditions of formation of bunches of plasma are different. A bunch or bundle of primary particles can have different forms, dimensions, compositions, energies and angles of incidence with respect to the Earth surface. In places where bunches of plasma have formed, there can be

different electric and magnetic fields, weather conditions, density and composition of atmosphere, etc. This diversity of factors affects not only the variety of shapes of plasma bunches, but also those phenomena which accompany their behavior and environmental impact. Thus, UFO is a bundle of plasma which is formed due to the magnetic field of an electron bunch caused by a combined EPS emerging as a bunch or bundle of high-energy relativistic charged particles is travelling in the atmosphere.

With certain reserves, a UFO can be considered to be an accelerator of ions with a bunch of electrons. A feasibility of this concept of ion acceleration is shown in the paper [4] where it is reported that the length of the section for accelerating ions to 1 GeV is ≈ 2 m with electron bunch energy E = 1 MeV. The kinetic energy of particles in the case of UFO hovering is mainly consumed to compensate for radiation losses. The energy losses per one revolution of a particle

$$\Delta W = \frac{1.17 \cdot 10^{-5}}{r} \cdot \frac{W^4}{E_0^3} \qquad [5, p. 240],$$

where W is the kinetic energy of a particle in GeV, E_0 is the rest energy of a particle in GeV, r is the orbit radius.

The velocity of protons with energy 2 GeV is equal to ≈ $2.847 \cdot 10^8$ m·s^{-1}. At this velocity, electrons have the energy 0.823 MeV. Therefore, for example, with this velocity of particles, r = 5 m, and β^2 = 0.949, the energy loss of particles will be: for electrons ≈ 73 eV per second, and for protons ≈ 415 eV per second. Besides, the energy is consumed for thermal losses, ionization of air and acceleration of trapped ions. A long life time of unidentified flying objects receiving no "feed up" is explained by the fact that electrons compensate energy losses at the expense of kinetic energy of ions. Since the magnetic field acting on the bunch has a finite value, the ions after obtaining a certain kinetic energy leave the plasma bundle. The eye-witnesses when approaching a UFO are subjected to the action of these ions. Besides, a "rope" of accelerated ions is formed in a UFO under the exterior electron shell. Under the action of an additional disturbance, e.g. an aircraft or the Earth, a bunch of ions is ejected in the direction of the disturbance (a beam "illuminates" the aircraft or a spot on the Earth).

When travelling in the substance, heavy charged particles lose their energy mainly as a result of inelastic Coulomb collisions with atoms resulting in their ionization and excitation. The length of travel of these particles in an amorphous substance without taking into consideration nuclear and elastic Coulomb interactions, i. e. considering only ionization losses, depends on the velocity of particles, their mass and the substance in which the particle is moving [6]. The fluctuations of travel lengths are insignificant, the root-mean square relative deviation for protons in air at R = 1000 m is ≈ 0.8 %, at R = 10 m is ≈ 1.4 %, and at R = 3 cm is ≈ 2 %.

For dense substances, the spread of percentages is greater, but it is not significant taking into consideration the length of travel. The energy losses are well characterized by the Bragg curve [7]. It shows that about 50 % of the energy of particles is released at the end of their travel. As particles are decelerated in a substance, their energy is transformed in small portions to atoms of the substance in the processes of ionization and excitation, as well as in the form of kinetic atom recoil energy. Besides, ionization is the cause of numerous breaks of chemical bonds resulting in decomposition of molecules and disturbance of bonds in lattices. If the recoil energy exceeds the bonding one, the atom will inevitably leave the molecule or the lattice node and will cover a considerable distance which in crystals will lead to accumulation of atoms in interstices and vacancies in lattices. The excessive recoil energy (as compared with the bonding one) is also converted into heat.

By the end of the travel of ions, when their specific ionization is particularly high, a very heated area or a thermal peak is formed for a short period of time, this peak producing the effect of a local thermal treatment. The heating can be so intensive that in an area of the diameter of several atomic distances the substance will be in a liquid state or in the state of a dense gas where, after cooling, a new arrangement of atoms will be observed. The displaced atoms form new crystalline displacements, additional stresses emerge along the axes of crystals, and the geometrical form of a body changes [8, p. 293]. This is the reason of anomalous changes of soil in the places of "landings" and "near-landings", unusual composition and properties of the minerals and elements comprising the soil (small glass balls, increased content of some elements, rare and unusual alloys, etc.).

These facts show that, unlike electron beams and X-rays which uniformly ionize the substance or the tissue of the biological objects which they penetrate, heavy charged particles (protons, ions, etc.) release the bulk of their energy at the end of their travel. The length of the travel depends on the energy of the particles. For example, protons with energy 100 MeV penetrate the tissue of biological objects 10 cm deep and release on the final 2 cm of their travel almost 50 % of their energy, i.e. 50 MeV, for ionization [9]. If a UFO is "hovering" above the surface of the Earth, then, as calculations show, in case of decelerating $4 \cdot 10^{13}$ particles wth initial energy 60 MeV in 1 cm^3 of soil, the grass roots will burn, and the grass will remain intact. Since the main part of accelerated ions are constituents of air – oxygen and nitrogen, then with increase of the energy of the particles, for example, to 2 GeV, the anomalies of the

soil will have the form of rings with the radius 16 m for protons, 4.6 m for ions of nitrogen and 4 m for ions of oxygen. The trees in the zone of the rings will dry out (at least partly), a dry tree is known to be the most characteristic sign of a UFO "landing". It is quite natural that this process will have a negative effect on microorganisms and vegetation. This is probably the clue to the "safety rings" and anomalies in the places of UFO landings.

These anomalies can have an insignificant radioactive background due to secondary radioactivity and will persist for a long time. Due to increased ionization and the effect of "natural accelerator", a drift of quartz oscillator frequency can be observed in the exposure places. Since ions release almost 50 % of their kinetic energy at the end of their travel, and almost all this energy is transformed into heat, the eye-witnesses exposed to a light beam from a UFO are not only subjected to ionizing radiation, but can have an interior injure of tissues if ions do not pierce the body, but are stopped therein. When exposed to a light beam from a UFO, eye-witnesses report sometimes a sensation of a very strong interior heating without any exterior signs of a burn.

A polymeric film appears on copper and stainless steel when they are bombarded with ions H^+ and He^+ with current density 0.1 mA/cm^2 and energy 50 - 100 keV at the pressure of residual gases (1.3 - 6.7)$\cdot 10^{-3}$ Pa [10, p. 122]. This is an analog of the natural process of "gossamer" (angels' hair) formation in case of exposure to a UFO. Eye-witnesses usually connect the appearance of this gossamerlike substance with the smell of burnt copper. Copper in the reaction of the polymer (angels' hair) formation plays, evidently, the role of a catalyst, the valence bonds of the polymer are weak and when exposed to the human body temperature (i.e. 36 $^{\circ}$C), they decompose. A "liquid spot" forms, according to eye-witnesses. Besides, sometimes eye-witnesses report the smell of gasoline and other hydrocarbons which are formed in the reaction of hydrogen and carbon combination.

Under certain conditions, in the case of direct exposure to UFO radiation, hallucinations appear, and the eye-witnesses can "contact" representatives of "supreme mind". If we view this problem in a historical perspective, we shall come to the conclusion that these phenomena were observed always, but were interpreted according to the concepts prevailing in the society at the time. Today, there are numerous factual data showing that under the influence of certain factors, visual, audible and other hallucinations may appear. For example, it is claimed in the work [11] that under certain conditions a person can have eidetic (image-bearing) visions which can often be of fantastic nature. In such situations, unbelievers imagine their relatives, assistants, etc., and religious persons imagine angels and saints. For example, Jeanne d'Arc "saw" Saint Michael and talked with him. (List of such communications is very long). Conversations of people with imagined partners, a loud talk with them is a form of self-regulation of human behavior in stress situations (for example, expectation of a contact when approaching a UFO)... In dialogues with imaginary partners a person is looking for a way out from a complicated situation and often finds it. Under usual circumstances, a person talks with imaginary opponents silently (inner speech), and under stress situations—aloud. An idea expressed in a verbal, oral, or written form, becomes to some extent estranged from the person. Healthy people often reason aloud in the moments of overcoming difficulties and dangers, which is a form of their self-encouragement. In these situations, a man needs a help from outside, and an idea expressed aloud acquires approximately the same significance as would have the words of another person concerning the situation in question. Thus, the UFO problem involves both reality and hallucinations.

Assuming a bunch of ions to be a current conductor, simple calculations show that with ion density of the flux $1\cdot 10^7$ cm^{-3}, conditions will be created for a phenomenon similar to corona discharge on high-voltage lines [13]. With intensity of electric field near a conductor (a bunch of ions) $E \geq 20\,000$ V/cm, neutral molecules of air are ionized by free electrons moving to the bunch of ions. With sufficient length of a zone of increased electric field intensity, several acts of collision ionization are possible as electrons are moving to the bunch. The electrons emerging in the process of ionization take part in the process, too. An avalanche of electrons is formed. Electron avalanches are indicative of a discharge in the air. The frequency of such avalanches is determined by the frequency of appearance of free electrons near the surface of a bunch of ions. If the electrons appear only under the action of exterior sources, the density of a bunch of ions increases, the majority of avalanches generate one or several photo-electrons which can initiate new avalanches. A self-maintained discharge emerges which is limited in the volume of air by the zone of high field intensity independent of the exterior ionizer [12]. A corona discharge appears. The great bulk of photons are formed near the surface of the bunch, since with advancement of electron avalanches to the bunch of ions the number of electrons increases according to an exponential law [13]. Since air an the area of a UFO exposure is strongly ionized, the ion density required for a corona discharge to form near the bunch of ions will be by several orders of magnitude lower than the theoretical one.

The electrons formed inside the bunch due to ionization of air with ions of the bunch travel along helical lines in a magnetic field, but since they have a steeper flight trajectory than ions, they quickly come to the bunch periphery. Therefore, the eye-witnesses caught in a light beam from a UFO perceive it as if it was hollow. The light is mainly

emitted due to braking radiation of electrons on the bunch periphery. The distribution of light quanta has a marked direction coinciding with that of the motion of electrons.

The average outlet angle can be calculated as:

$$<\theta>=\frac{m_e c^2}{U} \quad [9, p. 16],$$

where U is the total electron energy; m_e is the electron mass.

At U = 1 MeV, $<\theta> = 29^o$, and at U = 10 MeV, $<\theta> = 2.9^o$. Therefore, UFOs are visible only when "entering" the zone of these angles, and the illuminated area has a sharp boundary between the light and darkness. Radiation occurs partly due to return of electrons in the excited atmospheric atoms to the ground energy level, electromagnetic waves being emitted, for example, for nitrogen with wavelength $(25-45)\cdot 10^{-6}$ cm [14]. An analysis of the spectrum of braking radiation shows that it covers electromagnetic radiation frequencies from ultraviolet to infrared band. This radiation and action of ions are the cause of the burns which were inflicted to the eyewitnesses in spite of the fact that they were in an airplane or in a room behind opaque walls. Since the emission of light is caused by radiation of exited atoms of air (the excitation being caused by dissipated flux of ions) as well as by synchrotron radiation of electrons making up a UFO and by braking radiation, i.e. light is emitted not only by the object, but also by the atmosphere subjected to exposure, there will be no shadow from illuminated objects. Now description of eye-witnesses become intelligible: "...pale diffused light, sparkling snow, sharp boundary between light and darkness, no shadow".

When the luminous bunch hits a mirror it will "pierce" it without reflection, if the energy of ions is high; and the light will flow around the mirror or other objects, if the energy of ions is low. Having a sufficient energy, the bunch of ions can pass through walls. When doing so, the bunch will heat the air in the room due to braking of ions and transfer of energy to air particles. Besides, an illusion is created of a light beam passing through opaque walls (as was already mentioned, light emerges near the bunch of ions, i.e. inside the room). When emitting a bunch of ions in a pulsed mode, the beam will look intermittent, i. e. in the form of "running light". In case of gradual change of the energy of the ions in the bunch, the eye-witnesses could watch a protruding and contracting light beam (as a soldering torch). Since fluctuations of the travel lengths are insignificant, the eye-witnesses see the beam as if it was "chopped", i. e. without any apparent reason it is abruptly terminated in the air. If the density of ions in a bunch is great, and the excitation and ionization of air atoms are considerable, the light beam can exist autonomously, i.e. the object is gone, and the beam remains. The duration of autonomous existence of a light beam is governed by the time it takes for the electrons in the atoms of the elements comprising air to recombine and come back to the ground energy level.

There is no doubt that an ion flux can exert a mechanical action, since this phenomenon is used for processing hard materials, the energy of particles being up to 500 keV. If the ions in a bunch are "spent", the bunch can blow away sand, splash dirt, rock a lamp, bring pressure to biological objects, inflict injures to human body, etc. Using the main equation of the kinetic theory of gases

$$PV = \frac{2}{3} W_k,$$

where P is pressure of gas, V is volume of gas, and W_k is average kinetic energy of translational motion of gas molecules in the volume V, we shall find that to create pressure equal to that of wind with velocity 300 m/s (the strongest hurricane on the Earth had the wind velocity 330 m/s), it is necessary to release in 1 m^3 of air the energy equal to 131760 J. For that, $1.647\cdot 10^{16}$ ions of nitrogen, having the initial energy 100 MeV, have to stop at the distance 19.5 m in 1 m^3 per 1 s. It can happen if the density of ions in the flux is $1.283\cdot 10^8$ m^{-3}. Thus, there is a practical possibility to create the so-called "power screen".

When exposed to a UFO, the lighting in the houses above which the UFO is flying is reported to spontaneously switch on, internal combustion engines "stall", head lights go out, and automatic control systems fail. Calculations show that when exposed to a flux of ions of the corresponding energy and density, any medium can be rendered conductive. For example, due to ionization of the air gap in a switch in the circuit (in electric lighting circuits a switch usually breaks one circuit) a current will flow which is sufficient for light to spontaneously switch on.

Let us discuss the effect of a UFO on chemical current sources. A water molecule has an asymmetrical structure, and because of this the centers of positive and negative charges in water molecules do not coincide. Such molecules are dipoles. In a solution, dipoles of water are attracted by their negative ends to positive ions and by positive ends to negative ions. During this interaction, a lot of energy is released, this energy being referred to as hydration energy. An additional energy — the hydration energy — enables positive ions to break away from the lattice and, together with a shell of water molecules (hydrate shell), to go to the solution. Excess electrons remain in the metal, and the metal becomes charged negatively. The force of electrostatic attraction between the negative metal and positive hydrated ions does not allow the latter to move away from the electrode. Two layers of charges — a negative layer on the electrode and a positive one in the

solution – are formed near the electrode-solution interface. A double electric layer is formed which resembles a conventional capacitor. A potential jump is caused by opposite charges on the plates of such a capacitor. The distance between the capacitor plates has molecular dimensions, and the potential difference amounts usually to some tenths of a volt [15]. By way of example, consider a lead accumulator. The potential-forming process that takes place on the negative electrode of a lead accumulator is similar to the process described above:

$$Pb + HSO_4^- \rightleftharpoons PbSO_4 + H^+ + 2e \qquad [16]$$

As a result of this process, the electrode is charged negatively making up one plate of a capacitor. The second plate of the capacitor is formed by positive ions H^+ of an aqueous solution of sulphuric acid which in conventional concentrations dissociate practically only into ions of hydrogen H^+ and ions HSO_4^- [17]. A potential-forming process taking place on the positive electrode of a lead accumulator will differ from the one described above:

$$PbO_2 + 3H^+ + HSO_4^- \rightleftharpoons PbSO_4 + 2H_2O$$

We shall not touch on a complicated process of the interaction of PbO_2 with HSO_4^-, adsorption of O_2 on the electrode and capture of electrons from the electrode by oxygen. A simplification of the picture will not affect the final conclusions. As a result of this process, the electrode loses its electrons and is charged positively making up one plate of the double electric layer. The second plate is formed by negative ions remaining in excess after a part of ions H^+ has reacted with oxygen. In this case, a potential jump at the electrode-solution interface has the sign opposite to that of the potential jump of the preceding electrode.

Let us close the electrodes with a conductor via a load. The excess electrons of the negative potential electrode will start coming to the positive potential electrode, i. e. a current will emerge in the circuit. As soon as the excess of electrons on the electrode is over, ions H^+ in the double electric layer will stop being attracted to the electrode and will start moving deep into the solution where their concentration is lower than in the double electric layer. The equilibrium on the electrode-solution interface will be disturbed. The process will repeat in an attempt to restore he equilibrium. A continuous current will cause a continuous process.

Under the action of a high-energy flux of ions, due to ionization and nuclear-cascade process, the double electric layer at the electrode-solution interface is destroyed and the current in the internal circuit is interrupted. For example, the number of particles in the peak of a nuclear-cascade process emerging in solids when interacting with charged particles of energy exceeding 10^{10} eV, is

$$N_e^{\max} = 10\, E_0^{0.9} \;, \qquad [18]$$

where E_0 is initial energy of ions. The cross-section area of a nuclear-cascade process in the peak of its development for lead makes up 2.13 cm^2. The time of recombination of ions is ~ 10^{-11} s. Calculations show that when ~$5{\cdot}10^{10}$ particles with energy 10^{10} eV pass through 1 cm^3 per 1 s, the current-forming process will stop. As the electric power supply from an accumulator and generator is interrupted, an internal combustion engine will stop. Therefore, UFOs do not affect diesel engines which have no electric ignition systems.

Disk-shaped UFOs are in fact bodies of revolution in the nature of a top. The velocity and density of their constituent particles are high, therefore they behave like a solid body. In a ground layer of atmosphere, i. e. below 50 m, due to great vertical gradients of temperature, wind velocity, humidity, and nonuniform intensities of electric and magnetic fields, the motion of UFOs becomes unstable. A "precession" appears, as in the case of a top when its center line deviates from the vertical. Simultaneously, a disk is moving towards the minimum exterior effects along a curve resembling a helix. Therefore, the resulting trajectory of a UFO is that of a "falling leaf". Gradually, the motion is stabilized and the disk hovers above the surface of the Earth at a certain height. In some time, losing its kinetic energy, the disk becomes unstable and since it is close to the Earth, touching it with its edge, as a top, it abruptly travels aside rapidly losing its energy due to deceleration of particles in air. A disk appears to be "unwound" and "smeared" in space vanishing within a short time from the field of vision and leaving the impression of a "beam". However, under certain conditions, a UFO after losing a considerable amount of accelerated ions and becoming somewhat lighter than the ambient air, can "float". The motion of the disk will again follow a trajectory resembling the motion of a falling leaf.

Investigations of the places of UFO "landings" showed that the content of certain elements in the soil was anomalously increased. It can be explained as follows: under the action of high energy particles, some elements are formed in the synthesis reactions.

Within the framework of the suggested mechanism of UFO formation, there is a simple explanation of the radiation in the radio band of electromagnetic waves detected by radio sets exposed to a UFO. When plasma is injected in gas, there is radiation of electromagnetic waves. The frequency and maximum of intensity of this radiation depend directly on the parameters of the plasma bundle. This phenomenon is used for practical purposes.

These explanations are indicative of the fact that the existing concepts and the modern physics are far from exhausting their capacities in explaining cer-

tain phenomena which seem anomalous, unexplainable and even having some elements of intelligent behavior. What is required, is a non-traditional approach to solving these unusual problems. However, the author thinks it is his duty to state that when trying to find solutions to complicated problems of UFO type, we have to consider all the opinions, even those close to mystical ones. The way to the truth is long, sometimes sinuous and not always logical. To the understanding of the processes connected with formation of UFOs, their behavior and environmental impact the author has come through the assumption: "Supreme mind? And why not! But then in what way? And if it was done by somebody, why not to repeat it?"

As a result of this work, the author has come to the conclusion that UFOs are a kind of flying accelerator of ions with a bunch of electrons, and the anomalous phenomena are in fact quite natural.

On the basis of above considerations, it is possible to make certain conclusions concerning eventual scientific and practical application of the discovery of the UFO formation mechanism. Given below are some of these conclusions:

1. It is possible to maintain, that from the point of view of the physics of cosmic rays, broad atmospheric showers (at least, partly) emerge due to action on the atmosphere of the Earth not separate particles (as it is considered to be now), but of bunches or bundles of heavy charged particles of great energy, i.e. of bunches or bundles of cosmic rays when the number and energy of their constituent particles are not sufficient for UFO formation.

2. The maximum energy of charged particles (cosmic rays) is obviously much lower than 10^{20} - 10^{21} eV.

3. When exposed to a bunch of heavy charged particles of the corresponding energy, any medium (including insulation materials) becomes conductive for the time of exposure, hence, under the action of such a bunch, the systems using modern electronics (control systems, emergency systems, measuring and monitoring equipment, computer complexes, information systems, etc.) will behave unpredictably.

4. Under the action of bunches of heavy charged particles of the corresponding energy, the current-forming process is interrupted in the power sources (batteries, accumulators, etc.), and these sources are "paralyzed" for the time of exposure.

5. The eye-witnesses subjected to action of a UFO receive various doses of proton or ion radiation with all ensuing consequences.

6. There are grounds to state that a study of the UFO problem will lead to significant discoveries in the field of medicine, psychology and transmission of information.

7. There is one mechanism of UFO formation. However, the causes of this phenomenon can be different. Besides bunches or bundles of cosmic rays, the formation of a UFO can be caused by an "ejection" of high-energy electrons, for example, in locations of geophysical anomalies.

8. A particular case of UFO formation mechanism is the formation of ball lightning.

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THE SAAM PROGRAM

SEARCH FOR ALIEN ARTIFACTS ON THE MOON: A JUSTIFICATION

Alexey V. Arkhipov

Introduction

The search for extraterrestrial intelligence (SETI) is a fundamental scientific task. The many attempts to perform it have till now been unsuccessful. These have been made chiefly by means of radio astronomy. But it is impossible to a priori choose the best suitable strategy of the search, because we know practically nothing of the subject of inquiry. Therefore, it is topical to develop non-traditional approaches to the problem [2].

Thus, in the recent years, the interest has grown among researchers in search for traces of extraterrestrial civilizations within the Solar System [1; 6; 8; 11; 14; 16]. It was shown earlier that within the time of existence of our planet, approximately 10^4 stars capable of having inhabited planets approached the Sun to distances within 1.5 pc [4]. Such distances can be covered by space probes even at the present day level of science and technology [15]. Some ten stars with life-favorable neighborhoods have flown past the Sun at distances less than 0.05 pc [4]. In this case spontaneous arrival of artifacts in the Solar System could take place by the "gravitation sling" effect.

The researchers have chiefly concentrated on search for artifacts which are in orbits [7], on the Earth [16], or on asteroids [14]. It seems that this list should also include the Moon [3; 8]. Here we are going to justify this assertion.

The Moon as an attractor of artifacts.

As early as 1960 it was noticed that the Moon was of great strategic importance for military and weather forecasting observation of our planet [10; 13]. It is reasonable to expect that intelligent beings that explored the Solar System were interested in the Earth as a unique planet having a rare oxygen-containing atmosphere and, hence, a biosphere. Thus, the natural satellite of the Earth could be used as a convenient site for long-time observation of the Earth. Besides, there is a variety of other weighty arguments for placing equipment for prolonged Earth monitoring an the Moon rather than in orbit or on the Earth itself:

1. Because of screening of at least half the meteorite flow and ionizing radiation, the service life of an equipment on the lunar surface may be at least twice as long as that of a spacecraft in orbit.
2. Stabilization of an apparatus is simple.
3. Heat setting of an equipment sunk into the lunar ground is not a problem.
4. The mission may be effectively concealed from terrestrial "aborigines" (an orbital spacecraft is much easier to reveal).
5. Lunar soil can be used for life support of the station personnel, repair of equipment, etc. [8;17]
6. The absence of adverse effects of the atmospheric, geological and biological nature will offer a longer lifetime of an exploration station on the Moon than on the Earth.
7. The indisputable advantages of the Moon as an intermediate base for interplanetary flights are clearly demonstrated by the rise of interest of the USA and Japanese space agencies in the Moon [5].

It should be emphasized that because of the said reasons, landing on the Moon would be for ET visitors rather necessity than convenience. Thus, the Moon should be an attractor of alien artifacts, provided certainly that extraterrestrial civilizations have been really interested in the Earth. If there is not such interest, this means, in the author's opinion, that there are no extraterrestrial civilizations (at least capable of making interstellar flights) in a considerable part of the Galaxy.

State of the art in the study of the Moon.

The common opinion is that there has never been life on the Moon, since no traces of it have been found. Still, though the Moon is the best studied celestial body, it evidently has not been studied enough well to justify this view. Indeed, it is only about 0.5 per cent of the lunar surface that have been photographed with a resolution of 1–10 m [9]. But even the 1 m resolution can prove to be insufficient. For example, a photograph taken by Lunar Orbiter 3 shows the Surveyor 1 station on the lunar surface just as a light-colored boulder.

It is worthwhile reminding that lunar base projects [17] contemplate placing manned modules under the lunar surface to protect them from radiation and meteorites. It is not improbable that so did our predecessors tens of millions or even billions of years ago. Since that time traces of their construction

works could be destroyed by erosion, objects so becoming hard to reveal.

But the main obstacle in the search for artifacts is the principle of the Occam's razor which makes researchers regard a priori an artificial object on the Moon as a natural formation of a quaint shape or as a defect of the image. A geologist, for instance, will hardly identify a separately standing stone as a menhir even in England, let alone on the Moon. It is only a criminalist who can distinguish an artificial exploded crater from a natural one. But the Moon is usually studied by geologists, geophysicists, geochemists and astronomers accustomed to dealing with natural formations. All this is enough to suggest that the Moon is practically untouched in terms of the search for alien artifacts on its surface.

The prospects.

In the recent years the interest of space agencies in the Moon has revived [5]. A permanent manned NASA base on our natural satellite will be preceded by flights designed for detailed Moon exploration and search for possible construction sites. Japan is developing some projects of its own. Thus, the problem of lunar artifacts, now theoretical, can become quite practical. This however will require quite a set of things to do:

1. to analyze possible variants of the behavior of an extraterrestrial civilization on the Moon and to develop the search strategy;
2. to distinguish the likely indications of the presence of alien artifacts among the lunar phenomena;
3. to determine the most promising regions of archaeological prospecting on the Moon on the basis of the data available;
4. to develop the theory of evolution of artifacts on the lunar surface and formulate on this basis the general rules of lunar archeology.

These problems are to be worked by the research program entitled "Search for Alien Artifacts on the Moon" (SAAM) implemented by the Research Institute on Anomalous Phenomena. The present publication is an introduction to a series of papers which will present the results of the SAAM project.

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LETTERS

EXPLORING THE FRONTIERS IN THE JOURNAL OF SCIENTIFIC EXPLORATION

In 1981 a maverick group of scientists and scholars, of remarkably diverse academic backgrounds, came to the conclusion that there was a need for a new initiative in scientific research. They identified phenomena, or apparent phenomena, that were simply ignored by the scientific community even though they were potentially interesting and perhaps even of fundamental importance. One difficulty was simply that most such phenomena, almost by definition, would not fit into the highly compartmentalized research disciplines of modern science. And even if individual scientists or scholars were to be so bold — or reckless — as to engage in research on unconventional topics, not much progress could be made. That is because the scientific process does not comprise the uncorrelated work of individuals. Science is a collective, group process of sharing information, exchanging ideas, criticizing, testing, encouraging and building a rational consensus based on objective data and analysis. At least that is what it is as an ideal.

The primary means for accomplishing this, and which is used in every scientific discipline, is a research journal. A new kind of scientific journal was needed that would be open to any topic but rigorous in its scholarly criteria. Such a journal would have the dual purpose of promoting research in neglected or deliberately avoided areas, and would also by its familiar character draw new scientists into consideration of anomalous phenomena.

But a journal of this sort is not just created. Without articles there can be no journal, but without a journal there are no articles. The way out of this circular situation was to first of all form a scientific society, and thus was born the Society for Scientific Exploration (SSE). The first meeting of the SSE council fittingly took place at the National Academy of Sciences in Washington on January 5, 1982. Interestingly the most visible group within the leadership of the society was (and still is to some extent today) astronomers. In fact, a key impetus for formation of such a society was a 1977 questionnaire on UFOs to members of the American Astronomical Society by Prof. Peter Sturrock, a solar physicist at Stanford University and now long time president of SSE. Being a research-oriented society, SSE has a relatively small number of professional members (about 350), but has recently opened its doors to anyone supporting the goals of the society as associates.

The creation of the international Journal of Scientific Exploration (JSE) as the official publication of the society was accomplished in 1987. During the first five years, first under the editorship of Prof. Ronald Howard (1987-1988) and then by myself, JSE was published by Pergamon Press and appeared twice per year. It circulated mainly to members of SSE. Beginning in 1992, JSE embarked on an ambitious program to expand in size and readership as an independent publication of the society. It now appears quarterly to a worldwide audience that has increased nearly threefold in the past two years and continues to grow steadily.

The primary goal of the society and the journal is to provide a professional forum for presentations, criticism, and debate concerning topics which are for various reasons ignored or studied inadequately within mainstream science. A secondary goal is to promote improved understanding of those factors that unnecessarily limit the scope of scientific inquiry, such as sociological constraints, restrictive world views, hidden theoretical assumptions, and the temptation to convert prevailing theory into prevailing dogma. Topics under investigation cover a wide spectrum. At one end are apparent anomalies in well-established disciplines. At the other, we find paradoxical phenomena that belong to no established discipline and therefore may offer the greatest potential for scientific advance and the expansion of human knowledge.

The Society encourages such investigations for several reasons that may appeal to different communities. (1) To the research scientist, we commend the intellectual challenge of explaining away an apparent anomaly or seizing the new knowledge presented by a real one. (2) To the student scientist, we point out that science does not begin with textbooks: it beings with the unknown and ends with textbooks. (3) To the nonscientist, we acknowledge that deep public interest in some of these topics calls for unprejudiced evaluation based on objective research. (4) To the policy-maker, we point out that today's anomaly may become tomorrow's technology.

To encourage collaboration with members of the Research Institute on Anomalous Phenomena we are pleased to make JSE available at a $10 discount off the regular subscriber price. JSE is available to RIAP members for $35 per year ($40 per year outside the USA) for four issues. Call or write to: Journal of Scientific Exploration, ERL 306, Stanford University, Stanford, CA 94305, USA, phone: 415-593-8581, fax: 415-595-4466.

Bernhard Haisch, Ph.D.,Managing Editor, Journal of Scientific Exploration

(**Editorial** —continued from page 2)
not immune against the "illnesses", typical for such conditions. For a long time we struggled against quite different "illnesses", and the rapid process of "tabloidizing" of the UFO subject took many researchers by surprise.

Nonetheless, the general situation is not so bad. We have such serious specialists, engaged in ufological studies, as Dr. L.M.Gindilis (contrary to J.Oberg's opinion, the famous Gindilis Report[5] was neither sponsored, nor inspired by official structures), Dr. Yu.V.Platov, Dr. A.F.Pugach, Dr. M.Yu.Shevchenko, and many others. We also have (and this is extremely important) a considerable number of scientists, scholars and engineers who are not prejudiced against the UFO subject matter (as distinct from the majority of their Western colleagues) and are therefore ready to study it seriously and professionally. This can lead, in its turn, to achieving a very essential "intermediate aim" — assimilation of the UFO problem by science. The current difficulties of the everyday life in the C.I.S. may slow down this progress, but will hardly stop it. As is known, the human mind can display its creative abilities not only "owing to", but "in spite of" as well.

Contacts and collaboration between serious researchers from the Commonwealth of Independent States, Europe and America will certainly continue and develop. One of the instruments for such a collaboration is the recently-created Joint USA-CIS Aerial Anomaly Federation, headed by Dr. Richard F. Haines. It is engaged, in particular, in translating from Russian into English and distributing ufological materials from the C.I.S. Interested persons and organizations can contact the Federation at its USA office.[6] At least, you will have an opportunity to form your own opinion on the advantages and disadvantages of ufological studies in this part of the world.

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— **Vladimir V. Rubtsov**

BULLETIN OF ANOMALOUS EXPERIENCE

Bulletin of Anomalous Experience (BAE) is a networking newsletter about the medical, psychological and psychotherapeutic aspects of the UFO abduction and contact experiences. BAE is also a forum for mental health professionals and academics from a wide range of disciplines to discuss the broad range of paranormal experiences, as they relate to UFOs and the abduction/contact experience.

Abduction and contact experiences are dismissed by mainstream science and medicine, with the regrettable result that experiencers usually avoid seeking out medical or psychotherapeutic services. The resulting morbidity and social cost are unknown.

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Literature reviews: Abstracts (and sometimes longer excerpts) from the current literature of medicine, psychology, anthropology and folklore of particular relevance to anomalous experience are presented.

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